MULTIMEDIA UNIVERSITY

STUDENT ID NO

Seat No.: | | | |

Venue: _____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

TGD2151 – Computer Graphics Fundamentals
TCS2111 - Computer Graphics

(All sections / Groups)

17 October 2016
2.30 p.m. – 4.30 p.m.
(2 Hours)

Question No.	Marks
1	
2	
3	
4	
Total	

INSTRUCTIONS TO STUDENTS

1. This Question Paper consists of 8 pages with 4 Questions only.

2. Answer **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers CLEARLY in this Question Paper.

Question 1

a) i) What do the pixel depth and the state machine mean?

[2 marks]

ii) Why do personal computer (PC) games have better graphics than console games?

[2 marks]

iii) What is the size of the frame buffer (in KB) needed to store 32 bits per pixel for a raster system with resolution 1280 by 1024.

[1 mark]

b) i) Why is it useful to have a "universal" coordinate system independent of the camera?

[1 mark]

ii) List down **TWO (2)** differences between the World Coordinate System and Screen Coordinate System.

[2 marks]

Continued...

c) Write the OpenGL commands to perform the following tasks:

i) To set green color to a surface polygon.

[0.5 mark]

ii) To draw a point with the following coordinate: (2,0).

[1.5 mark]

Question 2

a) i) Find the equation for the plane through the point (0,1,−7) perpendicular to the vector (4,−1,6).

[2 marks]

ii) Find the parametric equations for the line through the points (3,2) and (4,6).

[1 mark]

Continued...

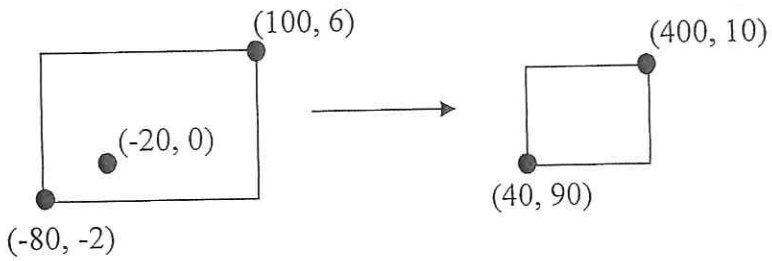
b) A straight line with pixel coordinate (0,3) to pixel coordinate (5,6), complete the following table for the pixel coordinates using Digital Differential Analyzer (DDA) algorithm.

[3 marks]

k	X_k	Y_k
0	0	3

c) i) Find the Window to Viewport Transformation in the figure below.

[3 marks]



ii) Compute the coordinates (u,v) if a point (-20,0) is transformed from window to viewport above.

[1 mark]

Continued...

Question 3

a) Given a function $y = \cos(x^2) + x + 5$, what is the 3D equation if we revolve the function about y axis for 360 degree?

[2 marks]

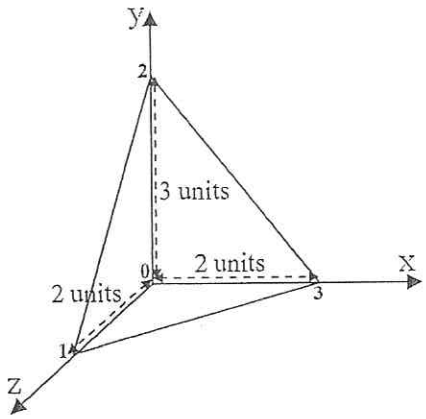
b) Find a 2D composite matrix in homogeneous form if we rotate an object 30 degree anti-clock wise order about z-axis and translate the object 2 units along x-axis and 1 unit along y-axis.

[3 marks]

Continued…

c) Complete the Vertex List, Face List, Normal List and Edge List for the prism below.

[5 marks]

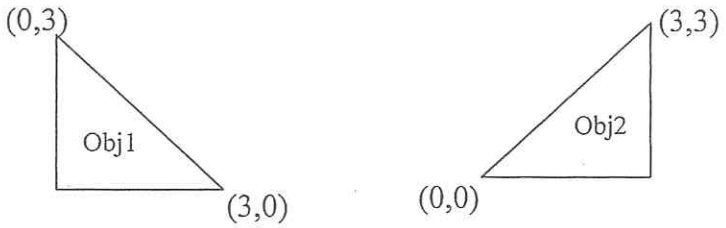


Vertex List				Face List			Normal List			Edge List	
Index	x	y	z	P_x	P_y	P_z	N_x	N_y	N_z		
0											
1											
2											
3											

Question 4

a) Given Z ranges from $-10 \leq Z \leq 20$ with black background, show the output display using Z-buffer algorithm if two objects (obj1=red, obj2=green) are drawn within the range above and their equations are $z = x+y-3$ and $z=2x+5y-2$ respectively. The width and height of the output screen are $0 \leq x \leq 3$ and $0 \leq y \leq 3$.

[5 marks]



Continued...

b) Given a point light source L located at (0, 0, 0) with the light intensity $I_L = 0.8$. Compute the intensity of the light at point $P(1, -2, 2)$ on the box if the light attenuation factor is $f = \frac{1}{a_0 + a_1 d}$ where d is the distance, $a_0 = 1$ and $a_1 = 0.5$.

[2 marks]

c) Polygonal modeling is an approach for modeling objects by approximating their surfaces using polygons. It is simpler and more general as compared to the other modeling methods such as NURBS surfaces, subdivision surfaces and equation-based representation using ray tracing. However, this method does have some weaknesses. List down THREE (3) weaknesses of representing object with polygons and discuss each of them in detail.

[3 marks]

End of Examination!